Dantherm®
Environmental Air Management

TECHNICAL MANUAL

WARM AIR HEATER TYPE VA-M 40

Oil Fired, Portable, Duct Type

OPERATION & MAINTENANCE

Manufacturer:	A/S DANTHERM
Item Number:	323250
Nato Stock Number:	4520-22-121-0561
Dantherm Publication No.:	971145 – Ver. 1.2 - 03.2004

Dantherm®
Environmental Air Management

A/S Dantherm
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hereby declare that the machine,

WARM AIR HEATER type VA-M40

is in conformity with the following directives:

89/392/EEC:	Directive on the safety of machines
73/23/EEC:	Low Voltage Directive
89/336/EEC:	EMC Directive

- and is manufactured in conformity with the following standards:

EN 292:	Machine Safety
EN 60335-1:	Safety of household and similar electrical appliances
EN 50081-1-EMC:	Generic Standard for Emission
EN 50082-1 EMC:	Generic Standard for Immunity

Skive, 13-08-2003

Per Albæk
Managing Director

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SECTION 1. INTRODUCTION

This DANTHERM Portable Heater has been designed and manufactured with high quality materials and care in workmanship. The instructions in this Operator's Manual have been prepared to ensure that, when followed, this Portable Heater will provide long and efficient service.

WARNING

It is the responsibility of the operator to read and understand this Technical Manual and other information provided and to use the correct operating procedure.
Heaters should only be operated by qualified (trained) personnel. Failure to do so can result in personal injury or equipment damage.

Read the entire manual before the initial start-up of the heater. It is important to know the correct operating procedures for the heater and all safety precautions to prevent the possibility of property damage and/or personal injury.

NOTE

The manufacturer reserves the right to make changes and improvements of its products at any time without prior notice or obligation, except for the logistic supply of spare parts.

SCOPE

This manual contains instructions for operation and maintenance of **heater, oil fired, portable, duct type, 40 kW output, model VA-M-40** as manufactured by A/S Dantherm.

SERVICE INFORMATION

All requests for information, service or parts should include serial number. Additional copies of this Manual can be ordered from the manufacturer.

Manual Item No.: DT 971145-10.98

For more information contact:
A/S Dantherm
Jegstrupvej 4, DK-7800 Skive, Denmark
Phone: Int. + 45 97 52 41 44
Fax: Int. + 45 97 52 61 34

Portable Heater

Record below and retain product model and serial numbers from the nameplate, which is located in the burner compartment on the partition to the heat exchanger.

Model No.	323250
Serial No.	
NATO Stock Number:	4520-22-121-0561

NAME PLATE DATA

Heater Model	VA-M 40
Nominal Heat Output	40,0 kW
Nominal Heat Load	44,3 kW
Oil Consumption max.	3,7 kg/h
Air Flow/Air Resistance	1760 m³/h / 200 Pa
Voltage	230 VAC, 1PH, 50Hz
Consumption, max.	3,9 A / 0,6 W
Weight	130 kg
Serial No	
Production Year	

INTRODUCTION

SAFETY AND WARNINGS

Safety must always be the operator's prime concern. The operator must read and understand this Manual and all safety signs on the heater before operating the equipment. Failure to follow these safety precautions could result in property damage and/or personal injury or death. This safety summary describes basic safety measures, which apply to the use and maintenance of the equipment. Further safety measures are described in other sections throughout this manual.

The following safety alert symbols are used throughout this manual:

DANGER: Indicates immediate hazards, which WILL result in severe personal injury or death.

WARNING: Indicates hazards or unsafe practices, which COULD result in severe personal injury or death.

CAUTION: Indicates hazards or unsafe practices, which COULD result in minor personal injury, or equipment damage.

NOTE: Indicates special features or operation of the heater.

CAUTION

Follow all rules of safety and safe operation.

DANGER

THE HEATER MUST BE GROUNDED WHILE IN USE TO PROTECT THE OPERATOR FROM ELECTRICAL SHOCK. THE HEATER COMES WITH A THREE-CONDUCTOR CABLE AND THREE-PRONG GROUNDING TYPE PLUG TO FIT THE PROPERLY GROUNDED RECEPTACLE. THE GREEN (OR GREEN/YELLOW) CONDUCTOR IN THE CORD IS THE GROUNDING WIRE. NEVER CONNECT THE GREEN (OR GREEN/YELLOW) WIRE TO A LIVE TERMINAL.

DANGER

ALWAYS DISCONNECT POWER CABLE FROM ELECTRICAL SOURCE WHEN NOT IN USE, BEFORE SERVICING AND WHEN CHANGING ACCESSORIES.

DANGER

USE ONLY APPROVED DIESEL, KEROSENE OR JET TURBINE FUEL. DO NOT USE GASOLINE - IT MAY CAUSE EXPLOSION OR FIRE.

DANGER

OBSERVE ALL STANDARD FUEL HANDLING PRE-CAUTIONS WHEN HANDLING FUEL. AVOID SPILLING FUEL ON OR NEAR THE HEATER TO PREVENT POSSIBLE FIRE. ALWAYS STOP THE HEATER WHEN CHANGING OIL LANCE FROM ONE DRUM/CAN TO ANOTHER.

INTRODUCTION

WARNING

Never operate the heater in the shelter, which has to be heated.

The heater is designed for placement in outside (open air) installations using flexible ducts to connect the heater to the shelter or other enclosed spaces.

WARNING

Do not park vehicles, engine driven generators or other equipment, which produces toxic or noxious fumes near the heater. These exhausts could be drawn into the fresh air intake of the heater. Avoid operating the heater in a location near objects, which could cause wind down drafts. Flue gases from the heater stack could be forced downward into the fresh air intakes.

WARNING

Any time personnel can sense exhaust fumes or fuel odours in the space being heated or ventilated, shut the heater down immediately. If an external source of the fumes cannot be detected and eliminated, the heater combustion chamber must be inspected for cracks or other defects.

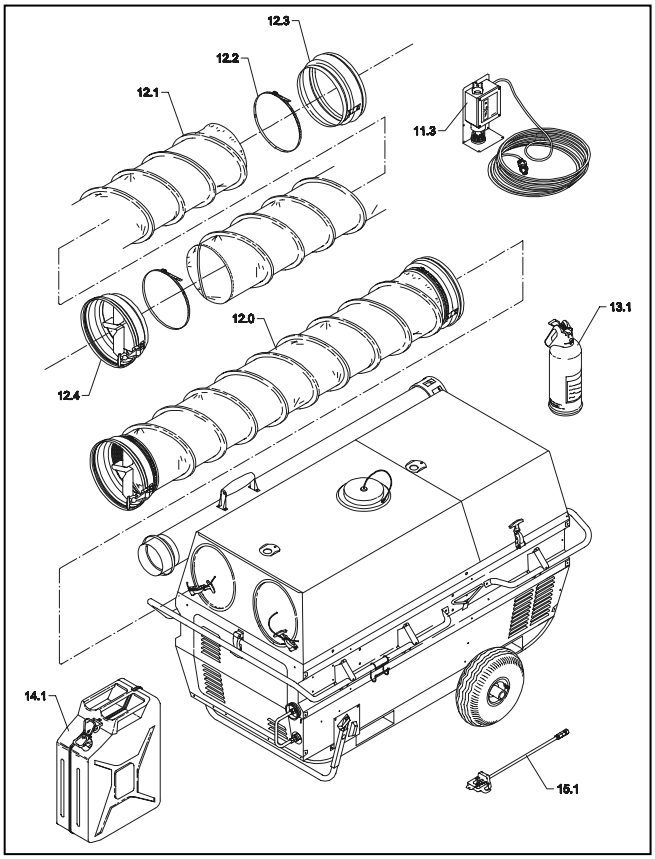
CAUTION

If the heater has been stored for an extended period, the heater should be run for 5 minutes before connecting the air hoses.

CAUTION

Do not disconnect the power until the supply air fan has stopped completely.

DESCRIPTION



PURPOSE AND FUNCTIONS

Dantherm Portable, Duct Type Heater Model VA-M 40 is designed primarily to supply un-contaminated, heated air to tents and other types of temporary or portable shelters. In addition, the heater is suitable for various field applications such as the warming up of cold soaked equipment, engines, vehicles, aircraft, and other spot or space heating requirements.

The heater operates on the in-direct fired (clean air) principle thus insuring that no combustion products or fumes are introduced into the occupied spaces. The forced air system provides for the most rapid warm-up capability. The units are essentially self-contained, requiring only a source of external electric power.

The model VA-M 40 burner will operate effectively on all Diesel and Jet Turbine fuels. Appropriate fuels are supplied by the fuel hose assembly, which may be connected to external jerry cans or drums. The internal fuel pump eliminates the need for gravity feed from the external containers.

Set up and operation can be done by a single person. After start up, the heater functions are automatic, thus permitting the item to be left unattended between periods of refuelling. An optional remote thermostat may be connected to the heater for accurate temperature control within a tent or other enclosure type. The control system also includes a "vent" only position, which can be used to bring in fresh outside air, or circulate interior air - even when heating is not needed. The item is designed to be suitable for all standard transportation modes.

All critical sub-systems and component assemblies are replaceable as modular kits; this insures repair capability at the unit level. No special tools are required for module replacement.

DESCRIPTION

PERFORMANCE CHARACTERISTICS

The heater has a maximum heat output of 40 kW with a minimum combustion efficiency of 85%. The unit will start at temperatures down to (-40°C), and is factory set for operation to an altitude of 1500 Meters. Operation at higher altitudes requires minor field adjustment of the burner. The protective enclosure permits operation in conditions of snow or rain.

Duct connections are provided for both supply and return air - making the heater suitable for either heating outside supply air, or recirculated interior air. (Re-circulation can significantly reduce fuel consumption). Optional air filter devices are available.

Manual lifting and carrying of the item can be done by grasping the peripheral handrails, which are also suitable as the tie-down provision. The undercarriage of the heater is provided with two skis, which aid in the movement over snow and ice. The wheel assemblies are detachable.

SPECIFICATIONS

Model ..... VA-M 40
NSN # 4520-22-121-0561
Heat output ..... 40 kW
Efficiency ..... >85%
Air flow ..... 1000-1760 m³/h
Fuel consumption .....3,7 kg/h ~ 4,4 l/h
Power consumption (average) .....600 W
Current consumption, max. 3,9A
Air discharge temperature, max..... 90°C
Dimensions:
length ..... 1400 mm
width..... 700 mm
height (without wheels) ..... 795 mm
Weight (dry)..... 130 kg
Duct connections ..... Ø 225 mm
Operating range ..... -40 to +30°C
Storage range..... -50 to +50°C
Fuels (approved) .....Diesel DF-A, DF-1, DF-2
Jet types - JP-8, Jet-A, JP-5, Kerosene
Electrical..... 230 VAC, 50 Hz

Surface treatment: Green Powder Paint
RAL 6014, NATO standard, IR-reflecting.

STANDARD CONFIGURATION

- Heater VA-M 40
- Insulated flue stack
- Oil lance for 200 l drum
- 2 wheels with rubber tyre
- Technical manual
- Tool kit with a few spare parts

OPTIONS:

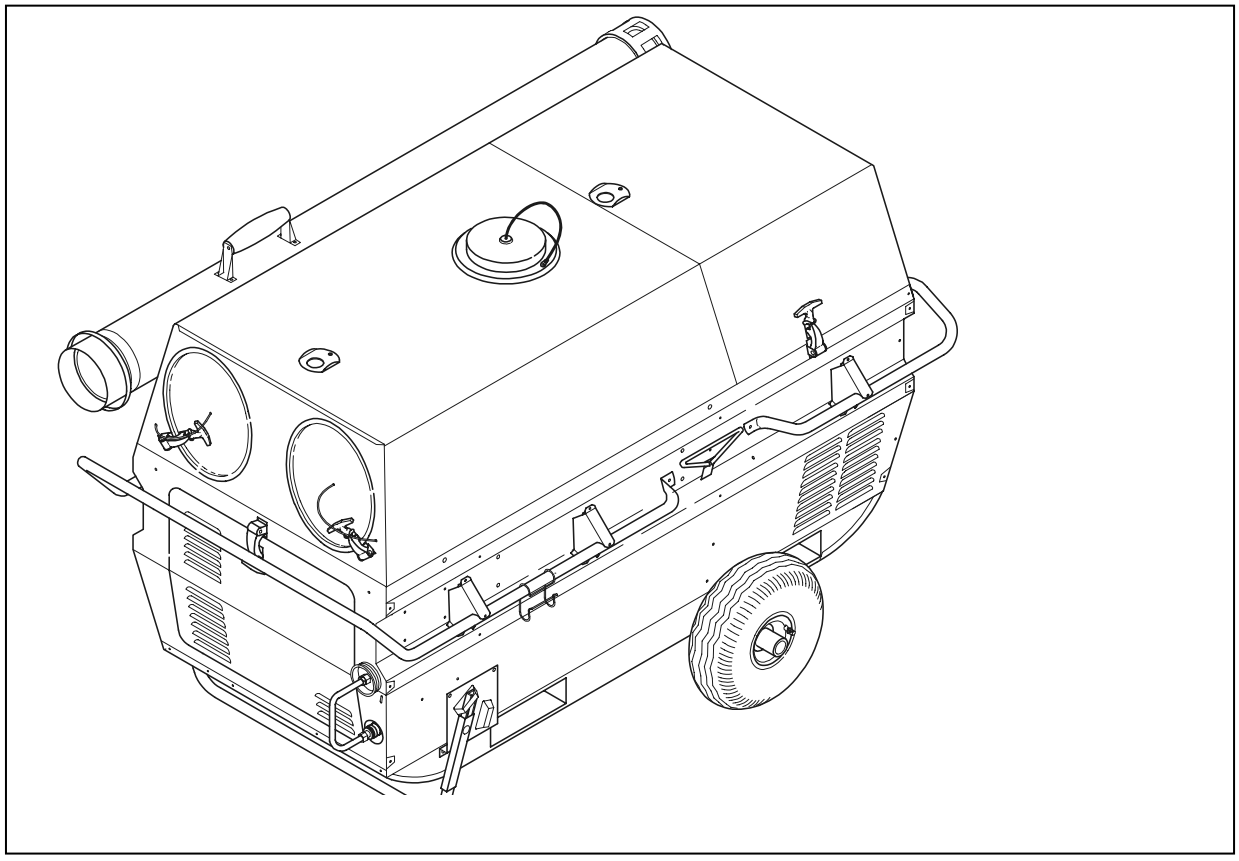
- Power supply cable, 25 m
- Remote thermostat with cable
- Air hose, 225 x 3100 mm with spigot and coupling
- Hose storage stand
- Oil lance for jerry can
- Dry powder extinguisher
- Complete flight line package with trailer
- Diesel generator

SECTION 2. DESCRIPTION

DESCRIPTION

The space heater components can be split up into four basic systems:

- Cabinet
- Combustion system
- Air circulation system
- Fuel system



CABINET

The steel cabinet completely encloses the space heater components and systems. When not in use, the power cable, remote thermostat, tool kit, technical manual, and wheels are stored within the storage compartment at the rear of the heater.

The two wheels can also be stored on top of the heater with the short axels put down into access holes. The wheels can be taken off and refitted by one man - no tools are required. The parking stand can be fixed in a horizontal position when the wheels are removed. The base of the cabinet is fitted with sledge runners, so that the heater can slide over ice, snow or earth. Slots in the sledge runners allow it to be handled by a forklift truck. A hook in the flue outlet opening makes it possible to lift the heater by a crane.

Air discharge and flue outlet openings can be closed, when not in use, by covers secured with rubber straps, which are designed to be operated

by personnel wearing protective gloves.

The flue stack is fitted with insulated handles for easy and safe fitting and dismantling. Prepared for storage the flue stack is placed on brackets along the cabinet side.

Handrails on each side provide convenient hand holds for lifting and carrying the heater. The handrails will also protect the heater during transport.

The hinged door at the front of the unit gives complete access to the burner compartment, which houses the oil burner, electrical controls, fuel systems and filter.

Grill openings to the fan compartment allow a certain amount of ambient air to be picked up, even if recirculation hoses are mounted. Instead of the rear top housing a diesel generator can be mounted in the storage compartment.

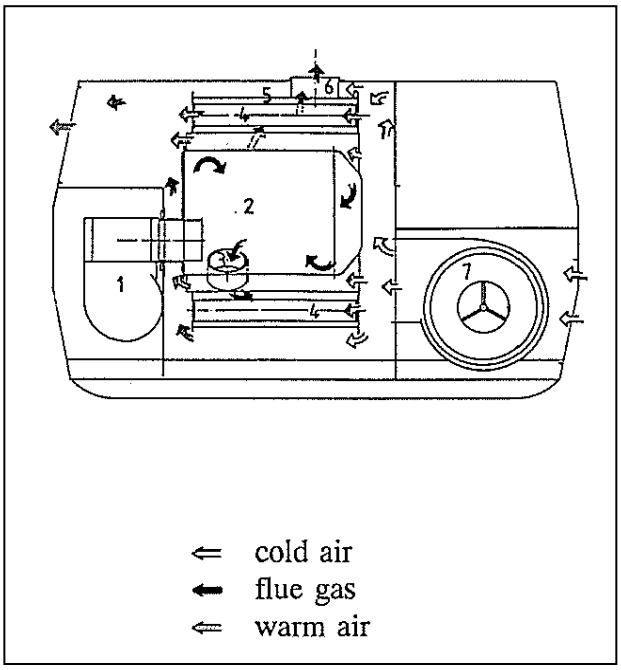


Fig. 3

COMBUSTION SYSTEM

This system consists of an oil burner, combustion chamber with heat exchanger, and the flue stack.

The oil burner includes an electric driven combustion air fan and a fuel pump, which delivers diesel fuel to the nozzle, where it is atomised. A certain mixture rate of combustion air and atomised oil will create a sort of gas which gives a high efficient combustion without soot.

An electric transformer makes high voltage for ignition across two electrodes at the initial start. When the flame is established the ignition is interrupted. The operation cycle is controlled by a solid-state electronic device. At start a 15 sec. pre-purge is followed by opening of the solenoid valve for oil atomising and for ignition. Safety shutdown will occur in five seconds, if a flame is not detected via the photo sensor unit.

The burner flame is confined within a combustion chamber and heat exchanger of sealed construction, which prevent the combustion gases from escaping into the air circulation system. The flame can be inspected through a small glass window in the warm air discharge department.

An insulated flue stack is extended to discharge the exhaust gases upwards about 2 m above ground.

AIR CIRCULATION SYSTEM

The air circulation system consists of a direct driven fan and internal air passages from the air inlet to the heated air outlet. The space heater can operate as a 100-percent outside (fresh) air heater or in a recirculation mode taking most of its' air from the heated space. Four air hose connections are provided, two on the supply discharge side and two on the inlet/return airside. The connectors are compatible with male spigots for Ø 225 mm flexible ducts, which are fastened with rubber latches.

DESCRIPTION

FUEL SYSTEM

Allowable fuel is diesel fuel, kerosene or jet turbine fuel. At an ambient temperature below 0°C the correct fuel type with a cloud point temperature below actual ambient temperature has to be used. The supplier of diesel fuel will normally deliver fuel type in accordance with this and actual time of the season.

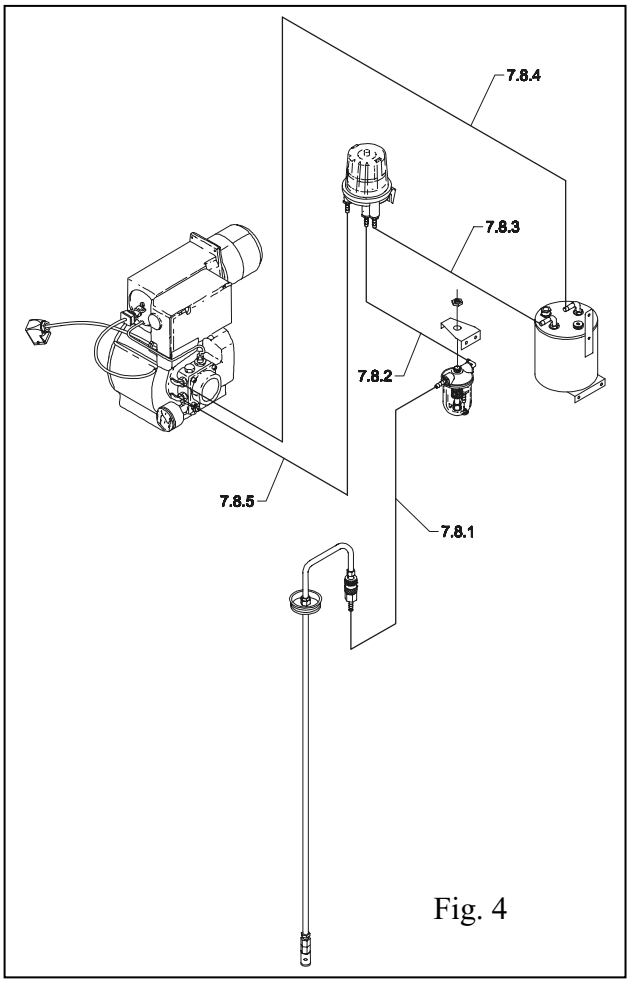


Fig. 4

Fuel is sourced externally from either a 200 l drum or a 20 l jerry can, and is drawn by the burner pump to the burner through a fuel assembly starting with oil lance for drum (standard) or a shorter one for jerry can (option).

The oil lance has a non-return valve in the bottom, which prevent the fuel from dropping back when the burner is not in operation.

In the fuel line there is a filter/water separator with a wire netting to pick up dirt and a glass receiver for collecting potential small amounts of water.

A flow control is working as an air bleed receptacle and a regulator to establish a constant flow in a loop between pump, preheater and flow control. A 300W fuel preheater is provided with integral thermostatic temperature control.

From the pump fuel goes on to the nozzle through the fuel pressure tube. The pump has an internal by-pass to lead part of the flow back into the loop with preheater and flow control. The pump pressure can easily be adjusted and a pressure gauge shows the actual pressure. In the pump there is a fuel filter which collect fine particles of dirt.

PRINCIPLE OF OPERATION

This space heater operates completely automatically in any of the modes selected on the control switch on the outside of the heater cabinet.

This switch has four positions:
1. "AUT"
2. "OFF"
3. "VENT"
4. "MAN"

Heater Operation. In any of the operating modes, except "VENT", the heater operation is the same. The burner fires directly into the combustion chamber. The flue gas from the combustion chamber flows through intermediate tubes to the heat exchanger and further out through the flue outlet and flue stack. The air circulator fan draws air in through the inlet duct and forces it through the heat exchanger tubes, which heat the air. The heated air exits through the outlet duct.

DESCRIPTION

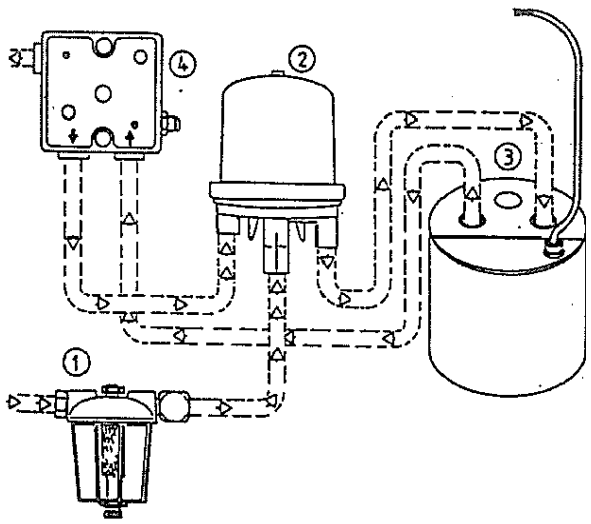
Remote Thermostat Operation. In the remote thermostat operation mode, with the switch at position 1. "AUT", the remote thermostat automatically controls the burner to maintain the space temperature called for by the thermostat. This is the normal mode for winter operation.

Ventilation Operation. In the switch position 3."VENT" only the fan operates. If both the inlet and outlet ducts are connected, the major portion of the air volume within the space is recirculated continuously. In this mode a small amount of outside air will be introduced through the cabinet grill louvers. If the return air ducts are disconnected, the unit will supply 100% outside air for ventilation purposes.

If a remote thermostat is connected in this mode, the burner will also operate according to setting temperature, but the fan will operate all the time. This mode can be used in summertime, when nights are cold, with the thermostat at a lower setting.

Continuous Heating Operation. In the switch mode 4. "MAN" the heater will operate all the time regardless if a remote thermostat is mounted or not.

Fuel System Operation. The heater is designed to have fuel supplied from external container sources. The fuel hose assembly with oil lance is connected to the standard fuel can adapter (drum or jerry can). Gravity flow is not required. When the unit is operating, fuel is automatically pumped from the container source, through the hose assembly, then into the fuel filter / water separator. After passing through the filter, the fuel enters the air bleed control, preheater, on into the burner-mounted pump and to the final atomisation and combustion process. Excess fuel is returned to the closed fuel circulation system. Entrained air is continuously vented by the air bleed control.



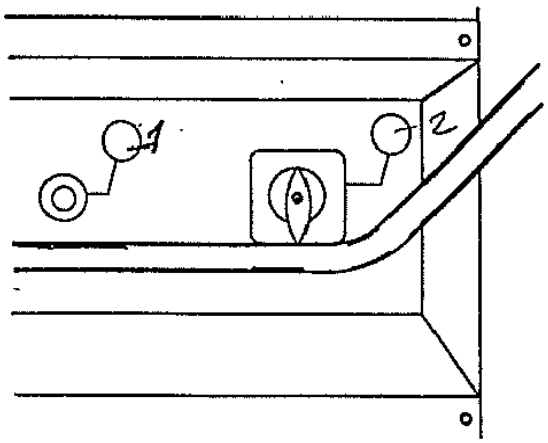
1. Fuel filter/water separator
2. Flow control/air bleed
3. Preheater
4. Fuel Pump

Fig. 5

CONTROL SYSTEM

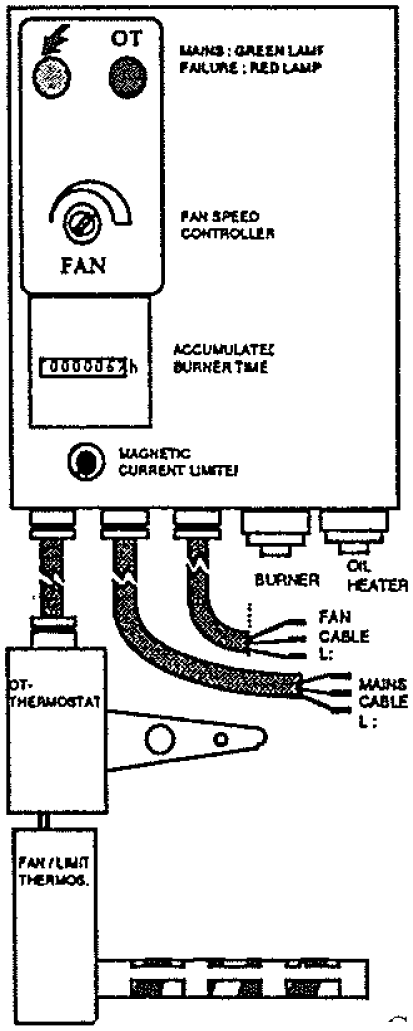
The heater incorporates a control system that allows fully automatic operation after a start cycle has been initiated. Safety devices will completely shut down ignition, fuel flow and fans in case of malfunction. All operating controls and components are mounted to permit ready access for operation, maintenance and troubleshooting.

The OPERATING POSITION on the outside of the heater cabinet includes the master control switch, power input receptacle, and the remote thermostat connector. The control panel located inside of the burner compartment incorporates status lights for power ON and safety/fault shutdown. An indicating circuit breaker for over current protection, an hour-meter for the burner, and a fan speed regulation are also found on this panel. The fan speed should always be on maximum, unless the air intake temperature is below -20°C. At such low temperatures the air discharge temperature will be higher if the fan speed is reduced, because the total airflow will thus fall.



1. Remote thermostat
2. Mains switch

Fig. 6



Control panel
(inside burner compartment)

Fig. 7

Overheat Protection. An overheat thermostat operate when the heat exchanger is in danger of being damaged from excessive temperature. This protector shuts down the fuel, ignition and air supply systems. The safety shutdown red indicator lamp on the control box will light. To reset the system, turn the main control switch to OFF. After the system has cooled down and after having checked that the air flow is not blocked by sharp bends on the air hoses etc., reset button on overheat protection and restart the main control switch.

Flameout Protection. A flameout protector reacts when the burner flame is abnormal or unstable. This safety device automatically shuts off the fuel flow, ignition and combustion air supply. To reset the system (after determining the fault) wait 2-3 minutes, then depress the flame safety reset button (with red light) on the side of the burner primary control. The heater may then be re-started. If not, then try again after a little while.

Internal Fan/Limit Thermostat. This so-called combi thermostat controls delayed fan operation and max. air discharge temperature automatically to factory preset temperatures. This means that the fan will not operate after burner start before the airflow is heated to approx. +35°C. After burner stop the fan will continue operation and cool the heat exchanger/combustion chamber until the air discharge temperature has fallen to approx. 30°C. The limit function automatically stops the burner if air discharge temperature exceeds 90°C for some reason. The fan continues and when the temperature has fallen about five degrees the burner will operate again.

SECTION 3. OPERATION

PREPLANNING

In planning the best arrangement for air distribution to tents or other enclosures, determine the best location for the heater within 1 to 2 m of the space to be heated, and access to an approved power source. The space heater requires 230 VAC, 50 Hz. The power cable is 25 m long. The maximum combined length of air ducts is 9 m on both openings.

Hoses for inside air distribution can be connected if the overall pressure resistance will not be too high. If so, the airflow will be reduced and the discharge air temperature can exceed the limit temperature, so that the burner operates on the limit thermostat function.

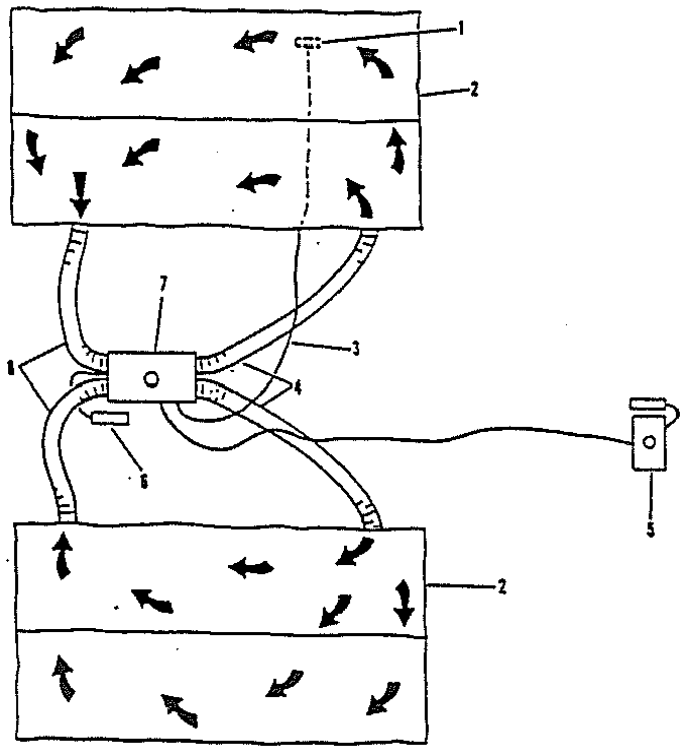
Allow space around the heater for access to operating and servicing the unit. If possible, keep unit away from areas of dried grass or leaves that presents a fire hazard, particularly from spilled fuel, or possible fuel leaks from external fuel hose connections or internal fuel leaks.

WARNING

Do not operate space heater in position where down drafts or wind currents can force flue stack exhaust gas down to the heater intake duct. Do not park vehicles where exhaust gas can be drawn into the heater intake.

Transporting (manual movement & lifting)

Handrails are provided on each side of the heater for moving and positioning the unit. Detachable wheels and integral skis assist with movement over snow, ice and other types of surfaces. The front stabilizer is used for levelling - particularly when the wheels are mounted.



Typical layout – 2 shelters per heater

1. Remote thermostat
2. Space to be heated
3. Remote thermostat cable
4. Supply air duct
5. Power supply
6. Remote fuel supply
7. Space heater
8. Return air duct

Fig. 8

OPERATION

SET-UP

1. Positioning. Determine the most suitable location for the heater as discussed in the preplanning section.

2. Flue stack. Remove the flue stack from the brackets along the side of the heater and install the flue stack into the flue flange after removing the cover.

3. Power Cable. Remove this cable assembly from aft storage, uncoil and route in the direction of the power source. **DO NOT CONNECT TO POWER SOURCE AT THIS TIME.** Open the hinged dust cap on the main power receptacle located at the operator station area of the heater, and engage the cable connector to the receptacle.

4. Dry Powder Extinguisher. If this extra accessory is available, remove it from the aft storage and hang it on the front bracket for the flue stack.

5. Supply Hoses. Remove the two front covers by loosening the rubber straps. Connect the male spigot on the hoses to the discharge openings and securely engage with the rubber straps.

The use of both openings is required at all times. Standard length of the insulated flexible hoses is 3 m but can be extended with one or two hoses more by means of the female coup-ling spigot in the opposite end of the hose.

Insert the end of both supply hoses into the shelter boots. Typical duct arrangement is shown on page 3-1.

6. Return Hoses. Return air hoses may be connected from the shelter to the return air inlets of the heater. The use of return air hoses will significantly reduce fuel consumption and cut down on outside air contaminants entering the shelters. Return air ducts are generally required in extreme arctic climates.

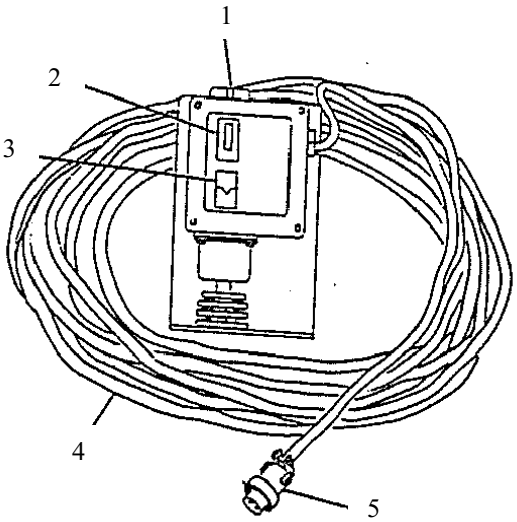
7. Fuel Supply. Verify that the fuel is approved for the intended use. Remove the fuel lance with fuel hose from the storage sleeve located on the front side and connect it to a compatible fuel drum.

The standard oil lance for drum can be replaced with a shorter one with adaptor for 20 l jerry can (accessory).

DANGER

AVOID SPILLING FUEL ON OR NEAR THE HEATER. PROTECT THE FUEL HOSE AND FUEL CONTAINERS BY KEEPING THEM OUT OF TRAFFIC AREAS. OBSERVE ALL DIRECTIVES FOR FUEL HANDLING AND FIRE PREVENTION. USE ONLY APPROVED DIESEL OR JET FUEL. DO NOT USE GASOLINE, WHICH MAY CAUSE EXPLOSION OR FIRE.

8. Remote Thermostat. The accessory remote thermostat comes with a 15 m cable and compatible connector attached.



1. Temperature control knob
2. Temperature setting indicator
3. Differential setting
4. Remote thermostat cable
5. Thermostat cable connector

Place the thermostat inside the shelter at the

desired location. Avoid the direct hot air discharge from the heater ducts. Good comfort control can be obtained by placing the thermostat at a height of 1,5 m and in a location near the return air end of the shelter. Set the desired temperature by rotating the knob on top, until the set point is displayed on the scale.

Route the thermostat cable out of the shelter to the heater. Connect the cable assembly to the small compatible connector receptacle located to the left of the master control switch.

OPERATOR CONTROLS.

The operator position on the left side at the supply end of the heater contains all of the controls required for normal operation of the heater.

Main Switch. The main switch selects the operating mode,

0. OFF	2. VENT
1. AUT	3. MAN.

When the switch is set at 0.OFF, the burner cannot operate.

1. AUT. Switch Position. With the remote thermostat connected and the switch turned to 1. AUT. position, the heater will automatically maintain the temperature called for by the remote thermostat in the space to be heated. The circulation fan runs at the same time as the burner, but with thermostatic delayed start and stop.

0. OFF Switch Position. When the switch is turned to 0.OFF position, the burner stops. The fan continues to run until the temperature in the heater has dropped to below 30°C.

2. VENT Switch Position. With the switch turned to 2.VENT, the heater functions as a ventilator with the circulation fan running continuously. The burner does not operate, unless a remote thermostat is connected, and the actual room temperature is lower than the thermostat settings.

3. Manual Switch Position. In the 3. MAN. switch position the heater operates continuously, regardless if a remote thermostat is connected or not. The operation will automatically be overridden by the limit thermostat function. If the air temperature exceeds 90°C the circulation fan operates continuously.

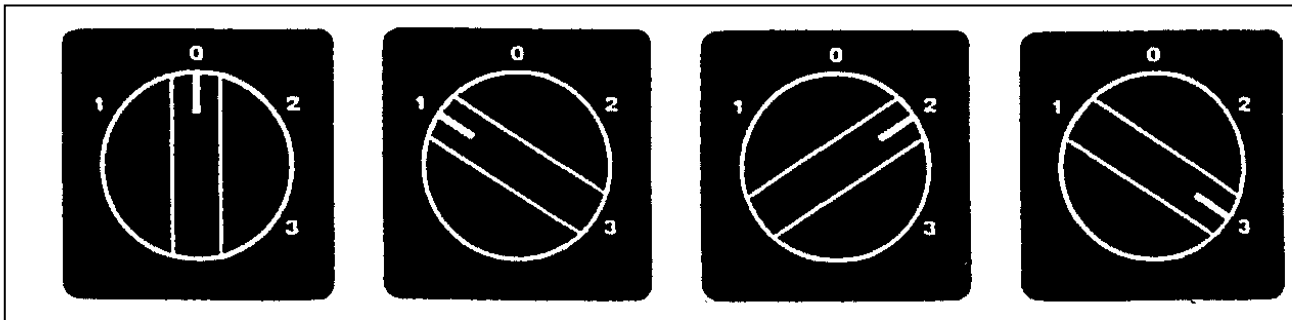
HEATER OPERATION

With SET-UP complete and the heater ready for operation, operate the system as follows:

Power Cable. Verify that the main switch is set at 0. OFF and the power cable connected to the heater. Connect the other end of the cable to approved external power source of 230 VAC, 50 Hz. When power is turned on to the heater the green lamp on the control panel will illuminate.

Remote Thermostat Operation. Turn the main switch to position 1. AUT.

When the room temperature falls below the set thermostat value, the burner will start and the ignition circuit will energize. After approx. 15 seconds (pre-purge) the solenoid valve will open the fuel supply and the combustion process starts.



OPERATION

The flame can be inspected through the inspection glass on the combustion chamber, if one of the hoses on the discharge end is removed from the unit.

The oil pressure can be inspected on the pressure gauge after having released the pressure to the gauge by opening the valve in front of it. The pressure should be 13 bar, if not, it can be adjusted on the pump. After inspection the pressure to the gauge has to be closed again.

If a flame is not established within 5 seconds the burner primary control will cut off the electrical supply to burner motor and solenoid valve. At the same time the red indicator lamp on the burner primary control will illuminate, indicating a fault.

When the internal temperature in the heater increases to 35°C the fan will start automatically.

The heater will now run until the desired space temperature has been reached. The remote thermostat will then switch off the burner, but the fan will continue to run until the temperature inside the heater has dropped to approx. 30°C.

When the space temperature has fallen below the temperature set on the remote thermostat, then the burner starts again.

If, for any reason, the internal temperature in the heater rises above the setting on the internal LIMIT-thermostat the burner will be stopped by this thermostat. When the temperature has fallen approximately 5°C the burner will start again if the preset temperature of the room thermostat has not been reached.

If the heater outlet temperature continues to rise, the over-heat thermostat will switch off the control circuit in the heater at approximately 116°C. The red indicator lamp on the control panel will be on. Re-starting takes place by pushing in RESET on the overheat thermostats after allowing the heater to cool.

Ventilating Operation. For ventilation only, turn the main switch to position 2.VENT. Only supply ducts should be in place to properly ventilate a space with outside air. The fan will run continuously with the burner cut off.
If a remote thermostat is connected and the actual room temperature is lower than the thermostat settings, the burner will operate. The difference from the operation in "1. AUT." will then only be that the fan is operating all the time.

Manual Operation. To operate the heater without a remote thermostat, turn the main switch to 3. MAN position. Now the heater operates continuously, regardless of the space temperature. If the discharge air temperature from the heater exceeds the limit temperature the LIMIT-thermostat will override and control the burner automatically but the fan will still operate.

OPERATION

HEATER SHUTDOWN

To shutdown the heater system from any mode of operation, turn the main switch to 0. OFF. The burner will cut off, but the fan will continue running for one to two minutes until the internal heater temperature has dropped below 30°C. Then the fan will stop. Disconnect the power cable from the power source. This completes the shutdown for service. If the heater is to be moved, continue the shutdown as follows:

1. Disconnect the power supply at the heater connector. Coil the power cable and stow it in the storage compartment.

2. Disconnect the remote thermostat at the heater, and replace dust cap on the heater connector. Stow the thermostat with cable in the storage compartment.

3. Disconnect the air hoses. Store the hoses onto the storage stands as required and replace the two covers on the discharge openings.

4. Remove the oil lance from the fuel source and store it in the cabinet sleeve.

5. Remove the dry powder extinguisher, if any, from the outside position and stow it in the storage compartment.

6. Remove the flue stack and store it along the cabinet side on the brackets.

7. If the heater has to be transported on a truck or moved upon snow, both wheels can be removed by lifting at the handle and at the same time pulling the wheels out in a horizontal direction. The wheels can be stored on top with the short axels put down into access holes behind removable covers. The parking stand in front has to be pushed down and lifted and secured in a horizontal position.

This completes the shutdown, ready for transport.

DAILY INSPECTION

After each day, or each eight hours operation, shut the heater down, disconnect the power connector plug at the receptacle socket and perform the following inspection:

1. Open the burner compartment door. Drain any accumulated water from the separator by turning the knurled drain cock on the bottom of the separator anticlockwise. Place an absorbent cloth or paper towel under the drain cock to prevent fuel/water mixture from spilling. Continue draining the water until no longer visible in the bowl.

2. Inspect all fuel hoses and fuel fittings for leaks, breaks or other damage.

3. Inspect electrical cables and connectors for loose connections or damaged cables. Check for scraped insulation or exposed wires.

4. Inspect power cable for breaks, skinned insulation and other damage. Check that the wires are not exposed at the fittings on each end due to bending or pulling on the cable when the fittings are connected to the power source or heater.

5. Remove debris that may have collected in the inlet wire netting.

6. Put the heater in operation again and check oil pressure on the gauge to be approx. 13 Bar as described under "Operation".

7. Check the colour of the flue gases leaving the flue stack after a stabilizing time of about 5 minutes from start. Normally the flue gas will be hardly visible, but on cold winter days it can have a white, milky colour.
   If the colour is dark grey: Stop the heater and clean/adjust the burner.

Refer any damage or irregularities to the responsible maintenance personnel.

FUEL HANDLING

Observe that only DIESEL FUEL is used. Approved fuels are listed in the SPECIFICATIONS section of this manual. Standard fuel handling procedures must be followed when handling, transporting and storing fuel.

WARNING
Do not use gasoline.

FUEL STARVATION SYMPTOMS

When running low on fuel, an unstable fuel flow occurs and the automatic burner primary control will shut down the burner. The red indicator light on the primary control will indicate a flame fault condition and the oil burner will be locked off.

NOTE

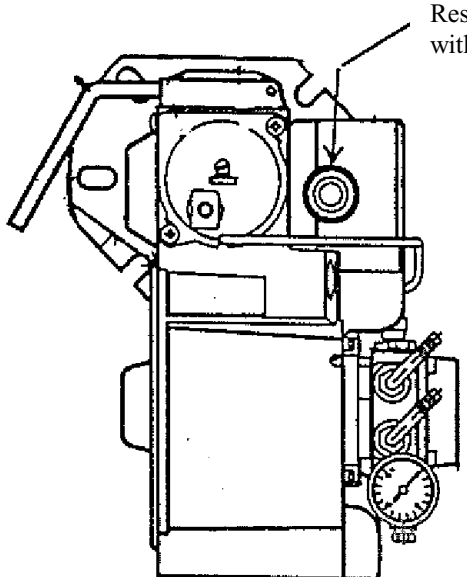
It is preferable to monitor the fuel supply and refill or replace the fuel supply before the heater stops.

To refuel and restart the heater after a fuel starvation fault, use the following procedure:

Master Control Switch. Turn to 0. OFF position.

Fuel Can Adaptor. Remove the adaptor from the empty container and insert into a replenished fuel can or drum.

Reset. To restart the heater after a fuel starvation condition it is necessary to reset the burner primary control. Open the burner compartment door and activate the reset by depressing the button once. The heater may then be placed in operation by selecting the desired position of the master control switch.



Oil burner – seen from front Fig 11

If the fuelling has picked up too much air the burner will perhaps not operate at the first attempt. Wait a little and press the button again, if it is alight.

OPERATION UNDER ABNORMAL CONDITIONS

Unusual or abnormal conditions must be carefully evaluated in order to determine the suitability of the heater operational use under such conditions. Examples of some abnormal conditions are -

- Operation of a heater placed inside of a shelter.
- Starting and operating the heater at temperatures below -40°F.
- Operation of the heater in extremely dusty or contaminated atmospheres.
- Use of the heater in or near explosive atmospheres.
- Use of the heater at high altitudes.
- Use of the heater in conjunction with other ventilation or exhaust systems.

Technical support is available from the manufacturer to assist in the determination of item suitability under abnormal conditions.

Operation at high altitudes

The burner adjustment from the factory will normally be sufficient up to 1500 m above sea level.

When used in mountains at higher altitudes the heater might start to produce soot due to insufficient oxygen for the combustion. In this case where dark grey exhaust is leaving the flue pipe some adjustments has to be made.

As the combustion airflow is adjusted close to its maximum a smaller nozzle has to be fitted instead of the standard 0.85 US Gal/h.
Additionally the air damper adjustment has to be increased to 10.0 and the combustion head to be adjusted to 2.1.

How this is done, see page 29, Combustion Adjustment.

At even higher altitudes the oil pressure should be reduced to 8-10 bar - performed in small steps, waiting for the result in between.

SECTION 4. MAINTENANCE

Maintenance has to be performed regularly, as preventive maintenance or, in case of malfunction, as corrective maintenance.

CAUTION

Before performing any maintenance, be sure the heater has been shut down and the power cable disconnected from the heater.

PREVENTIVE MAINTENANCE - "A"
Daily or Every 8 Hours of Operation.

1. Clean the cabinet and check for any damages or loose screw connections.

2. Remove any debris or foreign objects that may have collected on the air intake-netting screen.

3. Inspect electrical cables for damage or loose connectors.

4. Open burner compartment door and inspect fuel hoses and connections for damage or leaks.

5. Inspect the combined fuel filter/water separator, and if water has collected the knurled brass knob under the inspection glass has to be loosened to drain out the separated water in an absorbent cloth.

6. Regard the colour of the flue gas leaving the flue pipe under operation. Normally it should be hardly visible or light grey. If dark grey or black smoke appears corrective maintenance has to be performed.

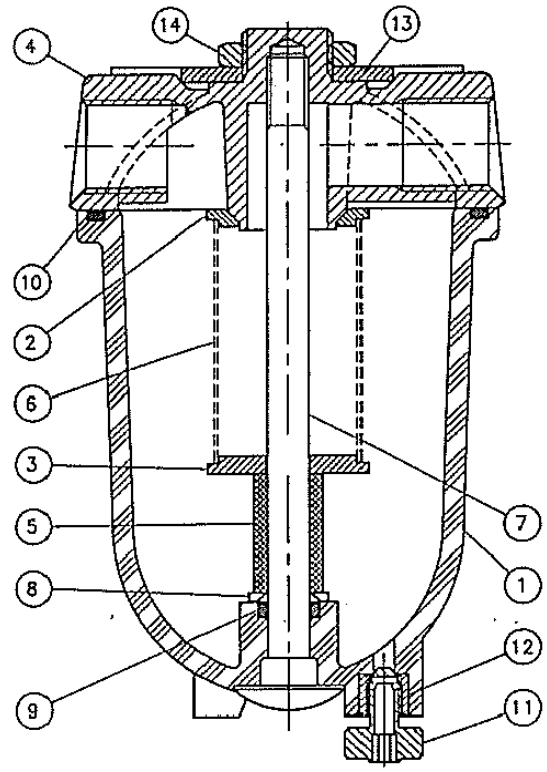
PREVENTIVE MAINTENANCE "B"
Every 6 months - or 300 hours of operation.

Whatever comes first - the burner operation hours are indicated on the hour meter.

The following preventive maintenance is required:

1. Carry out the procedure for daily preventive maintenance "A".

2. Empty the fuel filter/water separator and if the filter element is dirty, disassemble the bottom part by unscrewing (7). At the reassembly make sure that the filter element is in position towards (2) and (3). Also check that the O-ring is OK and in correct position.



Fuel filter / water separator

1. Plastic bowl
6. Filter element
7. Assembly screw
10. O-ring
11. Brass nut

Fig. 12

3. Remove the complete nozzle holder assembly through the front of the burner as explained under "Corrective Maintenance" and clean all dirty parts.

4. Unscrew the nozzle and clean its filter or replace with new nozzle.

5. Check electrode distance and position.

6. Clean the photo resistance.

7. Clean fuel pump filter.

8. Check flow control for impurities.

9. Check the oil lance non-return valve for dirt or damage.

10. Clean combustion fan wheel.

11. Inspect flue pipe flange and combustion chamber for accumulation of soot. Clean soot at pipe flange and vacuum out the combustion chamber.

12. Operate the heater and check all adjustment set points as explained in the corrective maintenance.

PREVENTIVE MAINTENANCE "C"
Every 12 months - or 600 hours of operation.

1. Carry out preventive maintenance "A"+"B".

2. Replace the oil nozzle.

3. Check and, if necessary, change the ignition electrodes.

4. Dismount the combustion chamber/heat exchanger from the cabinet. Clean it with a high pressure water cleaner and inspect it for any leakage.

After completing Preventive Maintenance procedures, check the quality and stability of the burner flame. With the heater operating and the supply duct removed, the actual flame is visible through the inspection sight glass. The flame should be yellow to white in colour with little or no smoke at the tips of the flame. The flame should be centred in the combustion chamber. If black or dark grey smoke is present at the discharge of the flue, there is an insufficient air mixture. Adjust the air (increase) until dark smoke is no longer visible.

NOTE
White smoke is often present at colder air temperatures. This is a normal condition.

Oil Burner Service. Refer to the Corrective Maintenance Section of this Manual for detailed instructions for these procedures.

CORRECTIVE MAINTENANCE

Trouble Shooting Chart. Malfunctions that might occur with operation of the heater are listed in the Trouble Shooting Chart. Symptoms of problems, possible cause and actions, or reference to actions required to restore heater to normal operating condition are listed in the chart.

If the heater should malfunction, find the problem in the headings listed, than refer to the possible causes and corrective actions listed with the problem. The list of problems, causes, and remedies will only give an indication of where a possible problem can be and what actions are needed to correct the problem. More or other possible remedial work may be needed beyond the recommendations in the list.

Special Tools. Bacharach Test Unit to test flue smoke. No other test equipment or special tools are required. Standard issue tool kits are adequate for corrective maintenance of the heater.

Controls and Heater Operation. The problems indicated in the Troubleshooting Chart are malfunctions that may occur during normal operation of the heater. The master control switch should be set at one of the applicable operating modes for determining the cause of the problem. Refer to the Operating Section of this manual.

MAINTENANCE

TROUBLESHOOTING CHART

Problem	Cause	Remedy
Heater does not operate, or stops operating. Green indicator lamp on control panel is not ON. Red indicator lamp is not ON. Circuit breaker on panel is not extended.	No voltage at heater power input.	Check that power cable is correctly connected to power source and heater. Check power source is turned on providing 230 VAC.
Circuit breaker button on control panel extended.	Over current spike or condition.	Reset breaker button. If breaker button pops out, verify that steady power 230 VAC is being supplied.
Circuit breaker button will not stay IN with correct power supplied.	Short circuit or high current draw due to component fault.	Check circuits to fan, preheater and oil burner.
Heater does not operate or stops. Green indicator lamp ON. Red indicator lamp ON.	Over temperature condition. Set main control selector switch to 0. OFF.	Check for blockage in supply or return air ducts, or collapsed duct. Clear out debris or blockage. Correct duct condition. Reset over temperature thermostat button. Restart heater.
Heater does not operate or stops. Green indicator lamp ON. Red indicator lamp is not ON. Red light in burner primary reset button ON indicating Flame Fault.	Out of fuel	Set main control selector switch to 0. OFF. Replenish fuel, reset primary control and then restart heater.
No Heat - Flame out. Red light in burner reset button ON.	Fuel delivery pressure low or unstable.	Check for low fuel supply. Replenish fuel and restart heater. Check fuel pressure at fuel pump on oil burner.
	Air in fuel supply system.	Visibly check for foam in flow control unit. Listen for hissing sound of air at hose, connections and pre-heater casting. Tighten fittings. Replace leaking hose, fittings or casting.
	Dirt in fuel system.	Replace filter - remove dirt from fuel components.
	Ice or paraffin in fuel system.	Warm up to melt ice and change to correct fuel type according to temperature.

TROUBLESHOOTING CHART (continued)

Problem	**Cause**	**Remedy**
No Heat - Flame out. Red light in burner reset button ON.	Obstructed fuel line.	Check for damaged or kinked fuel line.
	Flame photocell inoperative.	Replace photocell.
	Oil burner malfunction.	Remove oil burner. Service burner ignition, fuel nozzle and swirler plate.
	Oil burner primary control malfunction.	Remove and repair or replace primary oil burner control.
	Pump drive failure. Burner fan wheel is jammed. Burner motor operates but no fuel pressure.	Disassemble oil burner and repair or replace fan wheel.
	Pump drive-coupling failure. Burner motor runs but no fuel pressure.	Replace pump drive coupling. Replace pump.
	Fuel pre heater is not working. Safety fuse in the pre heater system has cut off.	Change the safety fuse in the pre heater.
Remote thermostat calls for heat but heater cycles frequently.	Internal unit thermostat control overrides.	Reduce air hose resistance and use ambient air instead of recirculation.
Black or dark grey smoke exhaust from flue stack.	Fuel/air mixture too rich.	Adjust mixture screw until smoke is white or light grey. Check burner flame.
Fuel spraying inside of burner compartment.	Air bleed valve sticking open.	Repair or replace fuel flow control.
DANGER **May cause fire. Shut off power to heater. Selector switch at 0. OFF.** **Stand by with fire extinguisher.**	Leaking fuel lines or fittings.	Check fuel lines for loose connections or damage. Tighten loose fittings. Replace fuel line and fittings if defective.
In cold weather operation, burner starts to run, then stops.	Check for ice in fuel filter/water separator lower plastic bowl.	If ice, remove filter canister and bowl. Warm up to melt ice, and drain water. Reassemble filter / separator unit.

CORRECTIVE MAINTENANCE PROCEDURES

CAUTION

Before performing any maintenance, be sure the heater has been shut down and the power cable disconnected at the heater to prevent possible electrical shock to personnel. Do not disconnect or reconnect electric cables with heater operating.

Corrective maintenance procedures are recommended actions to restore the heater to normal operating conditions for preventive maintenance or to correct operating problems. On completion of each corrective procedure, operate the heater to be sure it has been restored to normal operation.

Defective Electrical Components. If the circuit breaker button situated on the inside control box pops out because of a defective fan motor, burner motor or preheater, these components can be isolated individually to check which one is faulty.

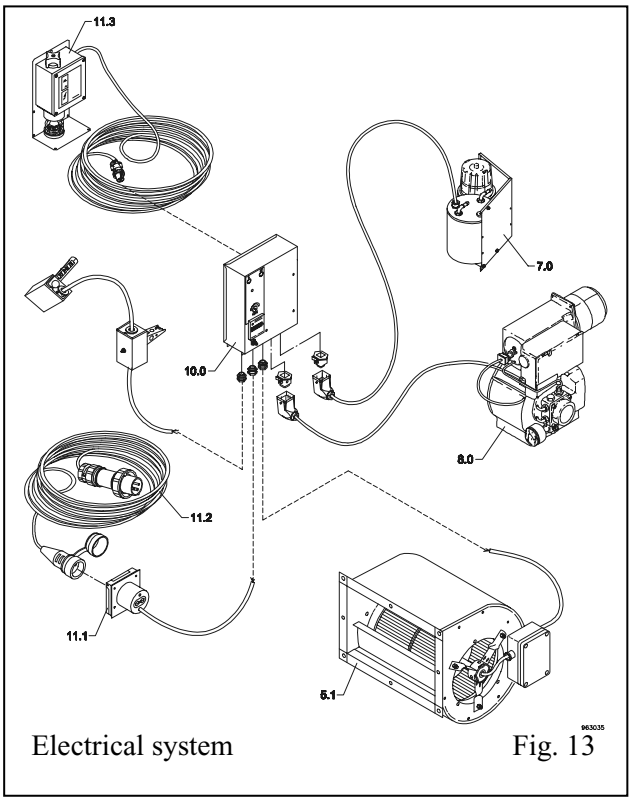
The procedure for checking each of the components is the same. Test each component separately by disconnecting it and see if the circuit breaker on the Main Control Box pops out or not.

CAUTION

Do not disconnect or reconnect electric cables with heater operating. Be sure heater is shut down, main switch at 0.OFF and power cable disconnected.

1. Disconnect the cable to the component to be tested individually. Push in the circuit breaker button.

2. Set the main control selector switch at 3. MAN position and start up the heater.



Electrical system Fig. 13

a. If the circuit breaker does not pop out, the circuit under test is not defective and the disconnected component must be defective. Shut down the heater. Repair or replace the component and operate the heater again to be sure it has been restored.

b. If the circuit breaker button pops out at least one of the remaining components must be defective. Shut down the heater and replace the disconnected component. Go on by disconnecting another component and push in the breaker button. Turn main switch to 3. MAN and see if the breaker still pops out. Continue in this way until the defective component has been found.

MAINTENANCE

FUEL DELIVERY PRESSURE CHECK.

Open the oil burner compartment door for access to the fuel pressure gauge.

1. Open the gauge valve by turning the screw below anticlockwise with a wrench.

2. Set main control selector switch to 1. "AUT" or 3. ON. Press burner reset button. Release button and read the gauge when the burner is operating.

3. Normal pressure reading of 13 bar with needle steady, not fluctuating, indicates normal fuel delivery pressure.

4. A fluctuating needle, low pressure reading, indicates unstable, fuel delivery pressure, which may cause flame failure.

5. Close the gauge valve after reading by turning the screw below clockwise.

Oil Burner Service consists of cleaning, adjusting or replacing the burner nozzle, swirler plate and electrode unit.

To remove the burner from the heater, open the burner compartment door, release the locking bar at the left side of the burner. Slide the burner assembly, with hoses and cables attached, out of the compartment.

Removal of nozzle holder assembly (fig.14)

- Disconnect the oil pipe fitting (1) from the pump.
- Take out the photo resistance (2) and loosen the screws (3).
- Remove the nozzle holder assembly; turn and slide carefully to the left.

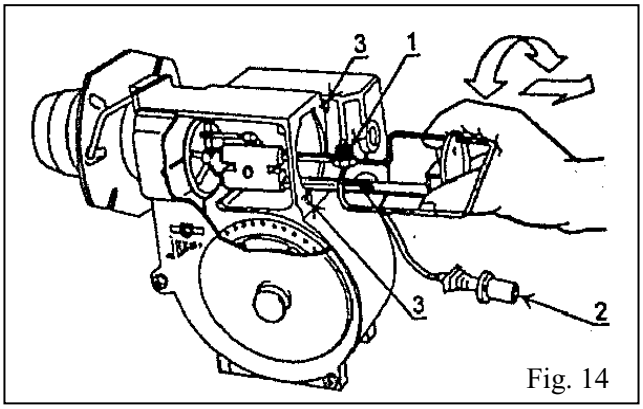
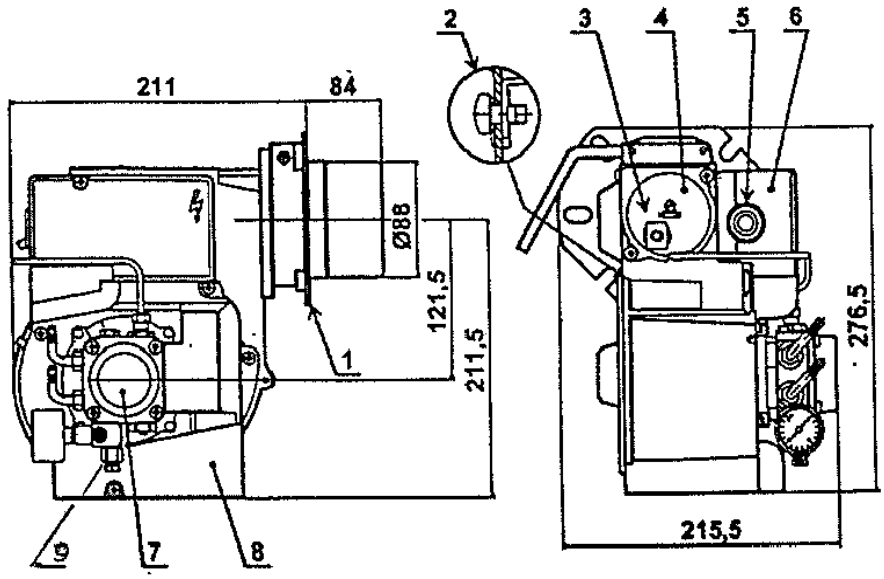
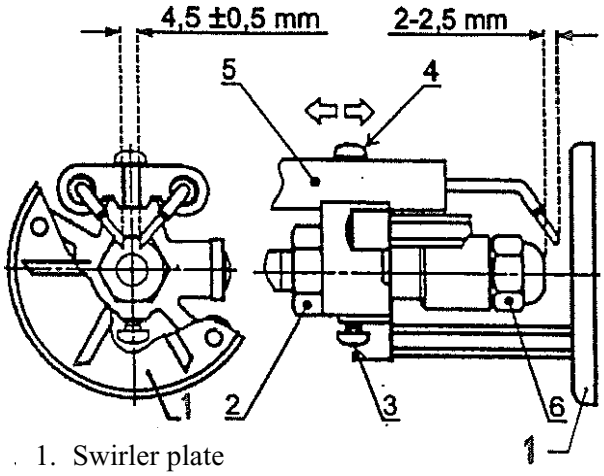


Fig. 14



1. Flange with insulating shield
2. Air damper
3. Photo resistance
4. Nozzle holder assembly
5. Reset button with lock-out lamp
6. Control box
7. Oil pump
8. Protection crankcase
9. Gauge valve

Fig. 15



1. Swirler plate
2. Nozzle mount
3. Fixing screw, swirler plate
4. Fixing screw, electrode unit
5. Electrode assembly
6. Nozzle

Fig. 16

1. Loosen the screw (3) and remove the swirler plate (1) with slide arm out from the holder.

2. Remove the fixing screw (4) and the electrode assembly (5).

3. Use an adjustable or open-end wrench to hold the base of the nozzle mount (2). Use a 16 mm socket wrench to unscrew and remove the nozzle (6).

4. Inspect the nozzle assembly. Replace nozzle if it is worn or damaged or if the filter is too dirty.

5. Clean soot from swirler plate with a brush and inspect for damage or distortion.

6. Clean and inspect electrodes. The points should be sharp. Adjust the gap, if necessary, to 4-5 mm. Replace worn down or distorted electrodes.

7. Screw nozzle onto the mount and tighten snugly with adjustable wrench and socket wrench.

8. Replace the swirler plate assembly with slide arm into the bottom of the holder. Lock with screw (3).

9. Replace the electrode assembly and lock with screw (4) after proper positioning the tips of the electrodes 2 - 2.5 mm in front of the nozzle.

10. Replace the nozzle holder assembly by carefully sliding in and turning in position.

11. Lock the end plate of the assembly with the two screws and put in place the photo resistance after checking that the glass window is clean.

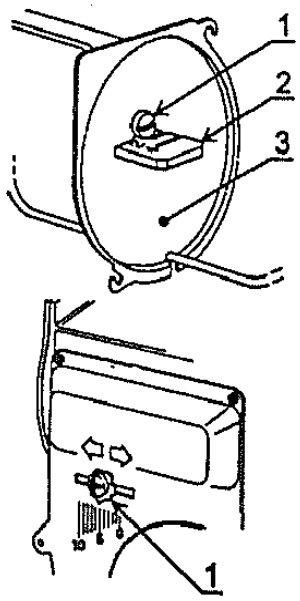
12. Connect the coupling of the oil pressure tubing to the mating fitting and tighten snugly with adjustable wrench.

13. Put the burner back in place in the burner compartment and secure it by pressing the locking bar downwards.

14. Start up the heater with main control selector switch at 3. MAN. Check the operation of the burner and the flame in the firebox. Adjust air damper and combustion head settings in accordance with table settings (see table).

COMBUSTION ADJUSTMENT

Nozzle		Pump Pressure	Burner Output	Comb. head adj.	Air damper adj. Set-point
[GPH]	Angle	[Bar]	(±4%)[Kg/h]	Set-point	
0.75	60°	13.0	3.1	2.1	5.8
0.85	60°	13.0	3.6	2.5	6.0
1.00	60°	13.0	4.2	3.1	10.0



Combustion adjustment

Air damper adjustment

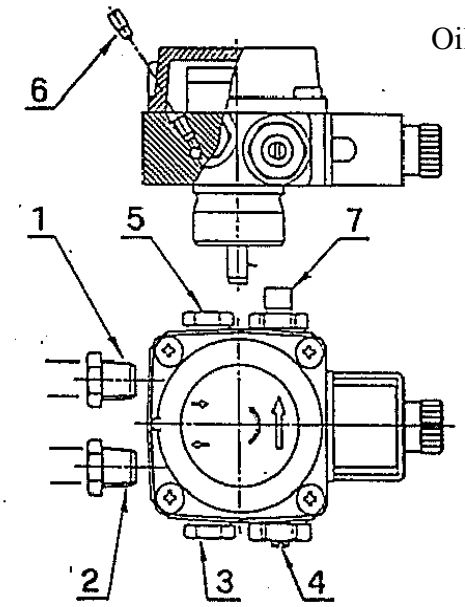
Fig. 17

To achieve good combustion and high performance output above table settings should be followed as a guideline. A finer adjustment of the air damper can be made in conjunction with a flue gas analysis with smoke test and CO_2% - but this is normally not necessary.

The factory-mounted nozzle is a 0.85 GPH but if a number smaller or bigger is mounted the settings have to be accordingly.

Combustion Head Adjustment (fig.17)
Rotate with a screwdriver the setting screw (1) clockwise or counter clockwise until the set point from the table is shown on the regulating rod (2) just in level with the outside of the nozzle holder end plate (3).

Air Damper Adjustment (fig.17)
Loosen the screw (1) and move the indicator towards the required set point and lock the screw (1) again.



1. Suction line
2. Return line
3. Pressure gauge connection
4. Pressure regulation
5. Vacuum gauge connection
6. By-pass screw
7. Pressure delivery line

Fig 18

Pump Pressure Adjustment
As described earlier under "Fuel Pressure Delivery Check" the pressure can be read on the gauge after having opened the gauge valve. The pressure has to be 13 bar and if not it can be adjusted with a screwdriver at the screw (4) on the pump. (fig. 18)

Do not forget to close the gauge valve again after the adjustment.

If the correct pump pressure cannot be achieved check pump filter, nozzle filter and the filter element in filter/water separator.

By-Pass Screw (6)
If a defective pump has to be replaced by a new one, do not forget that the screw (6) has to be inserted for two-pipe operation.

Pump Filter
Dismount the front cover of the pump after having removed the four screws at the corners of the cover. Remove the O-ring and the filter element. Clean the filter in fuel if possible or replace it with a new one and change O-ring at the same time.
Reassemble with front cover.

Fuel Pump Replacement

1. Remove high-pressure tubing fitting that attaches tubing to fuel pump.
2. Remove gauge.
3. Remove solenoid coil retainer clip.
4. Remove solenoid coil.
5. Remove fuel lines. Pay attention to colour code. Blue for outlet. Red for inlet.
6. Loosen the Allen screw, which attach pump to burner.
7. Remove pump.
8. Install replacement fuel pump. Connecting fittings come with replacement pump or have to be re-used from the old one.

REPLACEMENT OF BURNER PRIMARY CONTROL WITH IGNITION TRANSFORMER

- Take out the photo resistance (2, fig.14)
- Remove the nozzle holder assembly (fig.14)
- Remove the protection crankcase (8, fig.15)
- Disconnect the main voltage cable (3,fig.19).
- Remove screws (2, fig.19) and disconnect wires from motor, photo resistance and coil.

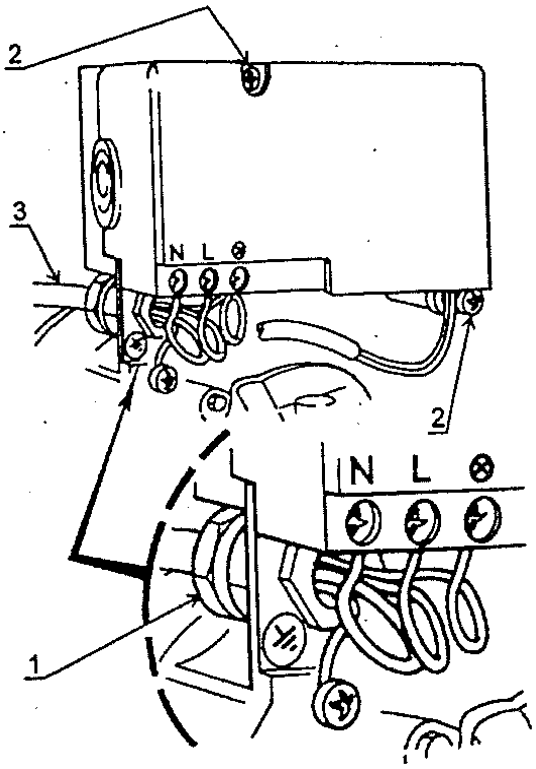
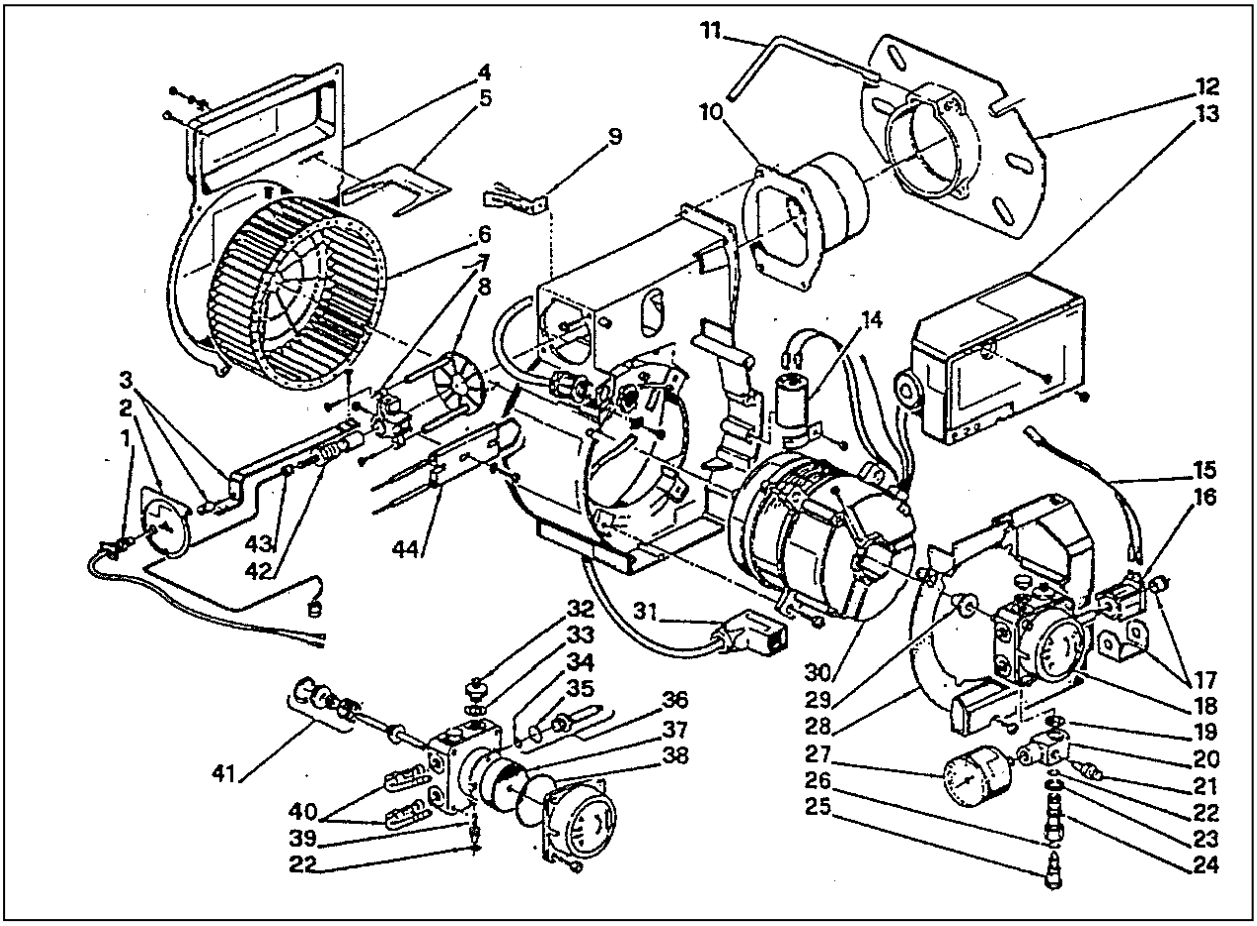


Fig. 19

Replacement of Other Burner Parts
Replacement of other burner parts as motor, fan wheel, or joints, are self explanatory when looking at the exploded view of the burner on next page.

MAINTENANCE



NO.	DESCRIPTION	NO.	DESCRIPTION	NO.	DESCRIPTION
1	Photo cell	13	Control box 535 SE	32	Nozzle outlet fitting
2	Cover	14	Capacitor 6,3 µF	33	Seal
3	Bracket & Screw	15	Leads	36	Valve
4	Fan cover	16	Coil	37	Filter
5	Air shutter	17	Shell	38	O-ring
6	Fan	18	Pump	40	Oil pipe connection with nut
7	Support	26	O-ring	41	Shaft seal
8	Turbolator disc (swirler plate)	27	Manometer	42	Nozzle holder
9	Conveyer	28	Protection, crankcase	43	Tube
10	Blast tube	29	Joint	44	Electrode assembly
11	Lever	30	Motor		
12	Collar	31	Lead		

FUEL DELIVERY SYSTEM CHECK

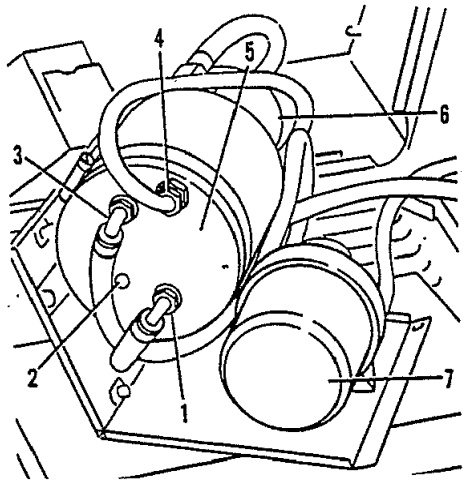
The fuel delivery system check consists of replacing the pre-heater, flow control and filter assembly. To inspect or replace the pre-heater, flow control or filter, remove the burner from the oil burner compartment.

1. Remove the cap screw that attaches the fuel delivery system bracket to the bulkhead inside the burner compartment.

2. Remove the four outside cap screws that hold the fuel delivery system bracket to the outside panel (10 mm wrench).
   a. Remove three of the outside cap screws.
   b. Place hand under fuel delivery system for support.
   c. Remove final cap screw.

3. Remove fuel system from burner compartment.

4. Observe fuel hose routing. Hose #1 is from the flow control. Hose #3 is to the fuel pump. The #2 position is not used.



1. Hose IN from flow control
2. Empty
3. Hose OUT to fuel pump
4. Electrical cord
5. Preheater
6. Filter
7. Flow control

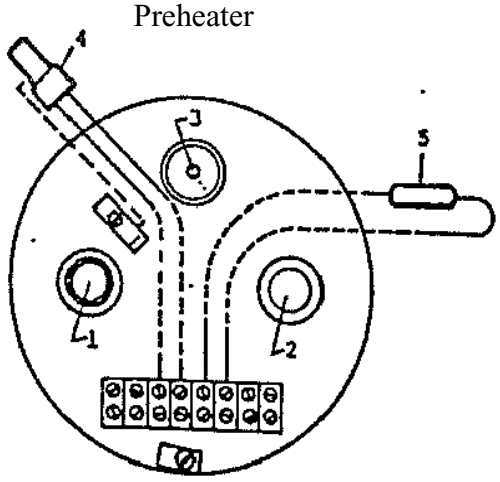
Fig. 20

5. Remove pre-heater.
   a. Disconnect electric cable on the terminals below the top cover.
   b. Remove hoses.
   c. Remove the three cap screws that hold the pre-heater to the bracket.

6. Install replacement pre-heater. Install hoses correctly and connect electric cable.

7. Install the three cap screws that hold the pre-heater to the bracket.

Preheater



1. To fuel pump
2. From flow control
3. Plug for cleaning
4. Operating thermostat (50°C)
5. Safety thermostat

Fig. 21

NOTE

The cause for replacement is normally a defective heating element, but it can also be failure of the safety thermostat under the top cover.

If a lot of dirt has collected in the canister, this can be emptied out through the opening No. 3.

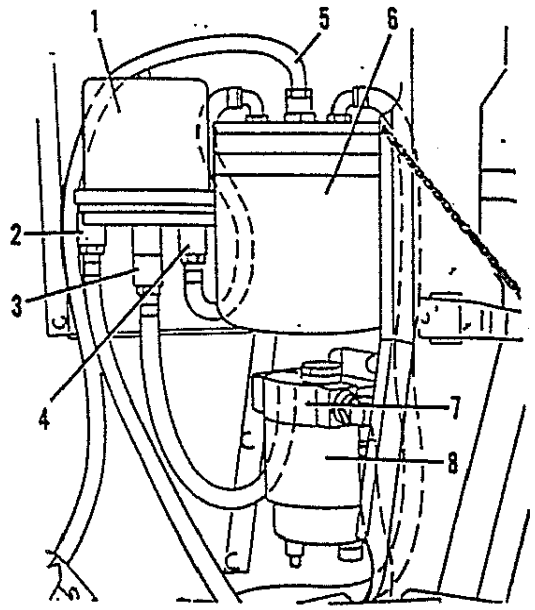
Do not forget to fill up with new diesel oil.

8. Remove flow control.

   a. Remove the three hoses. The hoses are (from left-to-right);
   - into flow control from fuel pump,
   - into flow control from filter and
   - out to pre-heater from flow control.

   b. Remove two cap screws that hold the flow control to the bracket (8 mm wrench).

   c. Remove flow control.



1. Flow control
2. Hose into flow control from fuel pump
3. Hose into flow control from filter
4. Hose out of flow control into preheater
5. Electrical cord
6. Preheater
7. Filter head
8. Filter

Fig. 22

9. Install replacement flow control. Install hoses (from left-to-right); into flow control from fuel pump, into flow control from filter and out to pre-heater from flow control.

10. Fix the two cap screws that hold the flow control to the bracket (8 mm wrench).

NOTE

The flow control cannot be repaired, but impurities can block the function. If this is the case, try to flush it out with clean fuel.

11. Remove filter / water separator.

    a. Lift up the complete assembly from the wall bracket.

    b. Remove the nut on top of the water separator/fuel filter assembly.

    c. Remove the two hoses. Hose facing bulkhead of burner compartment (left) goes to the flow control. Hose facing oil burner compartment door (right) comes in from the fuel source.

12. Install replacement filter assembly. Connect hose going to the flow control to the left side of the filter head. Connect hose coming in from external hose connection to the right side of the filter head.

13. Replace the holder arm on the top and tighten the nut.

14. Press down the filter assembly holder arm on the wall bracket.

NOTE

Normally only the filter element has to be changed or cleaned.
See Preventive Maintenance.

15. Install complete fuel system. Tighten four outside cap screws and one inside cap screw.

MAINTENANCE

COMBUSTION CHAMBER / HEAT EXCHANGER SYSTEM SERVICE

Preventive maintenance "B" advises inspection and if necessary cleaning of all parts which are in contact with the flue gas.

1. Remove the flue pipe and inspect it inside for soot deposits. Check also the flue pipe flange to the heat exchanger for soot. Small amounts of soot deposits can be removed with a stiff brush and vacuumed out.

2. Remove the burner from the compartment and inspect (with light) the combustion chamber through the burner flange hole. Soot can be vacuumed out and possible products of combustion on the bottom has to be cleaned out.

Preventive maintenance "C" recommend dismounting of the whole combustion chamber /heat exchanger from the cabinet.

Removal of this unit is explained in section 5.

1. Remove the circular cover with gasket from the bottom on the outside of the heat exchanger after removing the brass nuts.

2. Clean through this opening and through the flue discharge with high-pressure water cleaner and drain out all dirt and water.

3. Reassemble the unit and be sure there is no leaks on it.

WARNING

Leaks in the combustion chamber/heat exchanger may result in infiltration of dangerous combustion gases to the heated airflow.

LONG TIME STORAGE

If the VAM 40 should be in storage for a longer time a **PREVENTIVE MAINTENANCE "C"** service should be performed. After that the system should be run with fresh and clean fuel to check the performance of the VAM 40. After testing the VAM 40 leave the fuel in the oil system of the unit, as it prevent condensation inside the system and keeps all rubber parts smooth.

The long time storage conditions should be between 0°C and 30°C with a humidity not extending 60% relative humidity.

DISPOSAL

The unit should be disposed/recycled in accordance with applicable local laws, rules and procedures.

SECTION 5.
DISASSEMBLY OF MAIN PARTS

CAUTION

Before performing any disassembly, be sure the heater has been shut down and the power cable disconnected at the heater to prevent possible electrical shock to personnel. Do not disconnect or reconnect electric cables with the heater operating.

NOTE

The following procedures cover the disassembly of the heater down to unit level. These procedures should be followed in the order presented for ease of disassembly.

Reassembly after cleaning or service has to be performed in opposite order.

Burner Removal

1. Open the burner compartment door, release the locking bar at the left of the burner by turning it upwards. Pull the burner assembly, with hoses and cables attached, out of the compartment.

2. Disconnect the hoses; Blue for outlet, Red for inlet. Disconnect electrical cable. For oil burner assembly service, refer to oil burner service in the corrective maintenance section.

Fuel Delivery System Removal

1. Remove cap screw, inside oil burner compartment, that holds fuel system bracket to oil burner compartment bulkhead.

2. Remove three of the four outside cap screws that hold the fuel system bracket to the outside cabinet. Place hand in oil burner compartment to support fuel system. Remove fourth cap screw.

3. Disconnect hoses. For fuel system service, refer to fuel system service in corrective maintenance section.

Control Panel Removal

1. Disconnect burner and preheater plugs on the main control box as well as wires on the terminals in the control box for fan, thermostats and power supply.

2. Remove the four cap screws that hold the control panel to the heater cabinet.

3. Remove the switch knob and dust cap on the outside.

4. Remove heater control panel through the oil burner compartment door.

Fan Removal

1. Loosen the two rubber latches and remove the rear upper housing over the storage compartment.

2. Lift up at the rear and remove the bottom plate in the storage compartment.

3. Remove the 8 cap screws that attach blower discharge flange to the compartment partition.

4. Cut tie wraps off the blower cable.

5. Disconnect the blower electrical cable from the terminal wiring block. This isolates the blower from the main power assembly. Observe the wire colours and the terminal connections.

6. Remove blower.

Blower Main Power Cable	Connection	Blower
Green/Yellow	Ground	Green/Yellow
Blue	Neutral	White
Red	Phase	Red

DISASSEMBLY OF MAIN PARTS

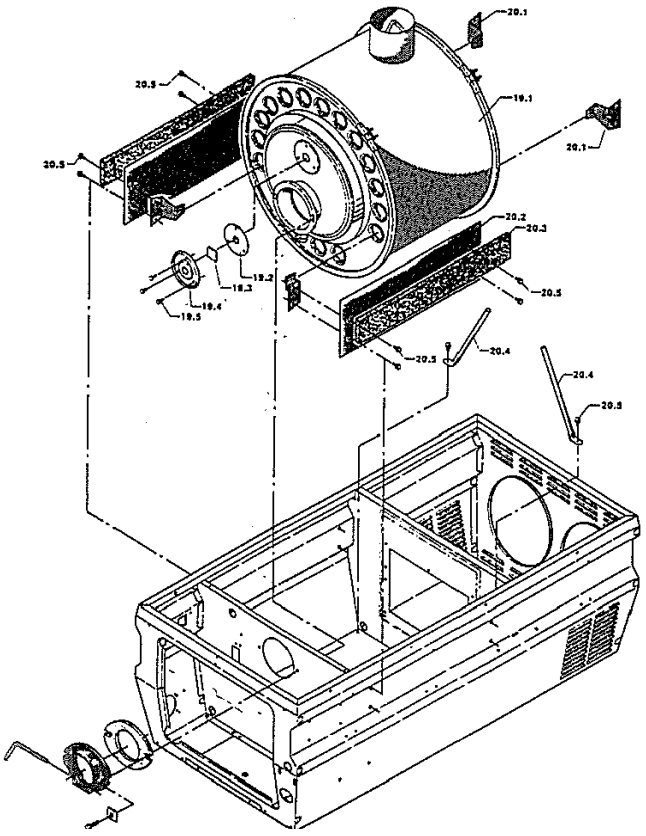


Fig. 23

Heat Exchanger Removal

1. Remove three cap screws from around the flue flange and the four cap screws at the sides of the top housing assembly.

2. Remove the top housing assembly.

3. Remove combustion chamber burner flange from inside the oil burner compartment. Remove two cap screws, star-washers and square spacers (13 mm wrench).

4. Remove the two thermostats fastened with Phillips head screws on the oil burner compartment firewall.

5. Remove the two cap screws on both sides of the undercarriage holding brackets for the heat exchanger at the rear end.

6. Lift up at the rear end of the heat exchanger and pull out, so that it gets free of the two front brackets.

Removal of inspection glass

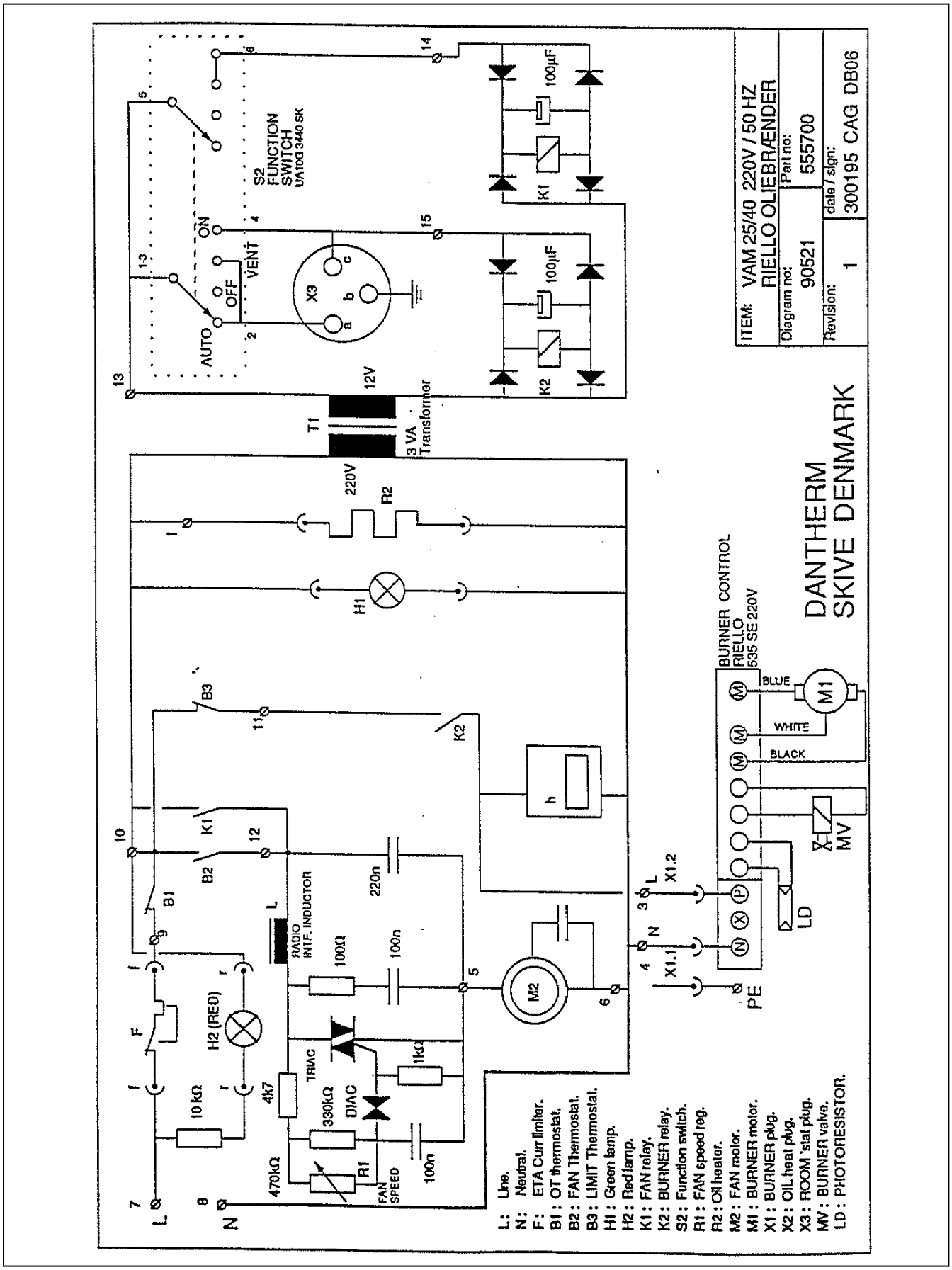
1. Remove three cap screws, outer face, gasket and inspection glass from front of heat exchanger unit.

2. Inspect gasket and glass and replace if damaged.

NOTE

Replacement exchanger includes sight glass and gasket. Sight glass and gasket can be ordered individually. Sight glass can be replaced without removing the heat exchanger unit by taking top housing assembly off and then removing the glass and gasket from the front.

APPENDIX


ITEM: VAM 25/40 220V / 50 HZ
RIELLO OLIEBRÆNDER
Diagram no: 90521
Part no: 555700
Revision: 1
date / sign: 300195 CAG DB06
DANTHERM
SKIVE DENMARK
S2 FUNCTION SWITCH UA10G 3440 SK
AUTO
OFF
VENT
ON
X3
T1
12V
3 VA Transformer
220V
R2
H1
K1
K2
100µF
B1
B2
B3
F
H2 (RED)
10 kΩ
4k7
470kΩ
R1
FAN SPEED
100n
RADIO INTF. INDUCTOR
100Ω
220n
TRIAC
DIAC
330kΩ
1kΩ
h
M2
BURNER CONTROL RIELLO 535 SE 220V
BLUE
WHITE
BLACK
M1
MV
LD
X1.1
X1.2
PE
L: Line.
N: Neutral.
F: ETA Curr limiter.
B1: OT thermostat.
B2: FAN Thermostat.
B3: LIMIT Thermostat.
H1: Green lamp.
H2: Red lamp.
K1: FAN relay.
K2: BURNER relay.
S2: Function switch.
R1: FAN speed reg.
R2: Oil heater.
M2: FAN motor.
M1: BURNER motor.
X1: BURNER plug.
X2: OIL heat plug.
X3: ROOM 'stat plug.
MV: BURNER valve.
LD: PHOTORESISTOR.